Model 5600ACO
Automatic Changeover

Instruction Manual

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IMPORTANT SAFETY INSTRUCTIONS

⚡	The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "Dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.
!	The exclamation point within an equi-lateral triangle is intended to alert the user to the presence of important operating and maintenance (Servicing) instructions in the literature ac-companying the product.

- Read this information
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

WARNING TO REDUCE THE RISK OF FIRE OR ELECTRIC – SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOSITURE"
WARNING DO NOT EXPOSE THIS EQUIPMENT TO DRIPPING OR SPLASHING AND ENSURE THAT NO OBJECTS FILLED WITH LIQUIDS, SUCH AS VASES, ARE PLACED ON THE EQUIPMENT"
WARNING TO COMPLETELY DISCONNECT THIS EQUIPMENT FROM THE AC MAINS, DISCONNECT THE POWER SUPPLY CORD PLUG FROM THE AC RECEPTACLE"
WARNING THE MAINS PLUG OF THE POWER SUPPLY CORD SHALL REMAIN READILY OPERALBLE"

INFORMATION TO USERS IN EUROPE

NOTE

This equipment with the CE marking complies with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European standards:

- EN60065   Product Safety
- EN55103-1   Electromagnetic Interference Class A (Emission)
- EN55103-2   Electromagnetic Susceptibility (Immunity)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the European Union EMC directive. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

INFORMATION TO USERS IN THE U.S.A.

NOTE

FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING

Changes or Modifications not expressly approved by Evertz Microsystems Ltd. could void the user's authority to operate the equipment.

Use of unshielded plugs or cables may cause radiation interference. Properly shielded interface cables with the shield connected to the chassis ground of the device must be used

REVISION HISTORY

REVISION	DESCRIPTION	DATE
0.1	Preliminary version	Feb 03
1.0	First Release	Mar 03
1.1	Added Table 2-3 – WA05600SYNCHRO Cable diagram	Aug 03
1.1.1	Added warning about proper termination of sync outputs in section 2.4.1	Sep 03
1.2	Added info about connecting 500ACO2-HDSD cards in ACO Extension mode	Sep 03
1.2.1	Added clarification on ACO Extension mode in sections 2.6 and 3.2.1	Dec 03
1.3	Added info in sections 2.5 and 3.4 about new dual GPI mode (available in firmware version 1.3 and later)	Jan 04
1.4	Added info in sections 3.3.1 and 3.3.2 about fast switching and Bank A priority (available in firmware version 1.4 and later)	Feb 04
1.5	Updated Safety Instructions, fixed minor typographical errors Added Firmware upgrade instructions	Jun 05

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1.   OVERVIEW

The 5600ACO Automatic Changeover is intended for use with two 5600MSC Master Clock / Sync Generators. The 5600ACO system uses latching relays to ensure maximum reliability and minimal disruption in the event of any failure. The complete system provides the highest level of security for television station video and time synchronization systems.   Two power supplies are included as a standard feature, to alleviate any single point of failure concerns.

The front panel has three switches, recessed into the panel for added security. There is an AUTO / MANUAL switch, a GPI / FRONT PANEL switch and an A / B select switch for manual changeover. In automatic mode, all signals from both 5600MSCs are scrutinized to detect any abnormal signals. For example if a level, pulse width, phase, time code error or other abnormality is detected, the 5600ACO circuitry will trigger and the entire bank of signals will be switched to the backup 5600MSC. In manual mode the changeover can be operated from a GPI or from the front panel switch. Twenty-two LEDs provide status information as to the health of the two 5600MSCs, together with indication as to which one is active. In addition two GPO outputs indicate which master is active and when the inputs from both masters are not the same.

The 5600ACO offers connections for 6 colour black, (or bi-level or tri-level sync signals), 10MHz, DARS and two linear time codes (LTC) to each of the two Master 5600MSCs. Each 5600MSC Master offers two LTC outputs that may be used for different time codes. All four LTC signals are fed to the 5600ACO on two 'D' connectors, one for each Master. The LTC outputs from the selected master are available on two XLR connectors.

Each 5600MSC is equipped with 2 GPI inputs and 2 GPO outputs. To facilitate installation, these connections are through to a 2 x 6 pin terminal block on the 5600ACO. The outputs from the 5600MSCs are passed straight through the 5600ACO. The inputs to the 5600MSCs are internally split by a 'Y' connector, to ensure that both 5600MSCs receive the same GPI contact closures.

In the event of a changeover occurrence, it is necessary that all outputs on one 5600MSC have the same timing as those on the other. Identical timing for both 5600MSCs is assured by locking both to the same frequency and phase source (e.g. GPS or by genlocking one 5600MSC to the other). Identical phasing of the independent black outputs is assured by implementing the *Syncro* mode in the 5600MSCs. To use this mode, both 5600MSC communication ports are connected together using the link cable supplied with the 5600ACO. With both 5600MSCs operating in *Syncro* mode, timing adjustments made to one 5600MSC will be automatically applied to both. The link cable is connected permanently, so that any system re-timing will be applied to both 5600MSC units.

Features:

- Relay switches for all the system critical outputs from two 5600MSC units
  - 8 video/sync/DARS or other coaxial signals
  - 10MHz frequency reference output
  - Time Code outputs
- Automatic changeover is a voting system based on which source has the most valid signals and that the good signals on the present master are also on the backup.
- Three front panel switches select automatic, front panel or GPI activation of changeover
- Front panel switches are recessed to prevent accidental operation
- 20 Front panel status LEDs show the health of each of the inputs
- 10 Front panel status LEDs show the operational modes of the changeover
- Redundant power supply
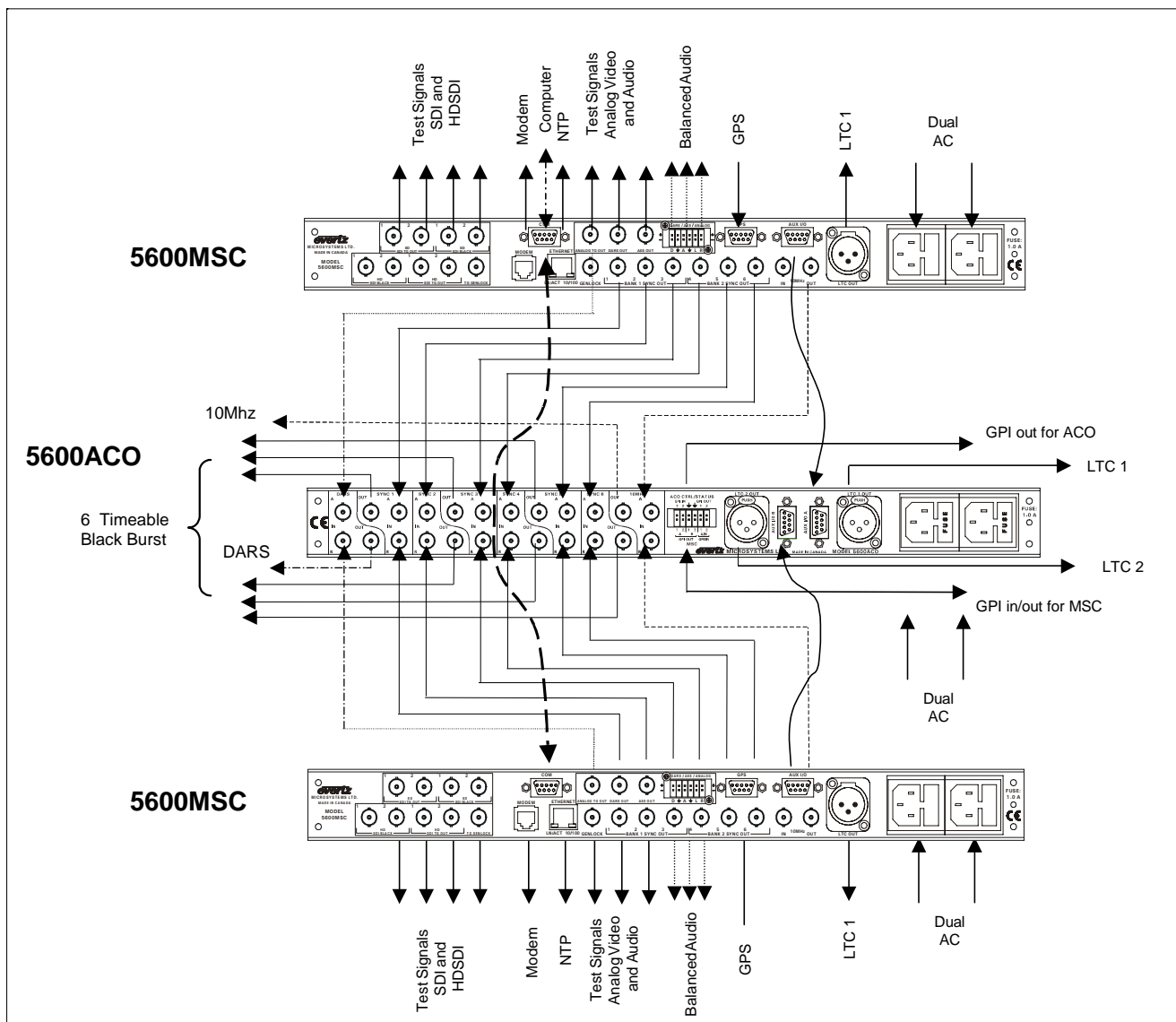
Figure 1-1: Redundant Master Clock/SPG with Auto Changeover System Diagram

1.1.   HOW TO USE THIS MANUAL

This manual is organized into 4 chapters: Overview, Installation, Operation, and Technical Information. There are individual tables of contents at the beginning of each chapter as well as an overall table of contents at the beginning of the manual to aid in finding the information you want.

✍	**This symbol is intended to alert the user to important operating instructions.**

⚠	**The exclamation point within an equi-lateral triangle is intended to alert the user to the presence of important safety related operating and maintenance (Servicing) instructions in this manual.**

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2. INSTALLATION

2.1. REAR PANEL
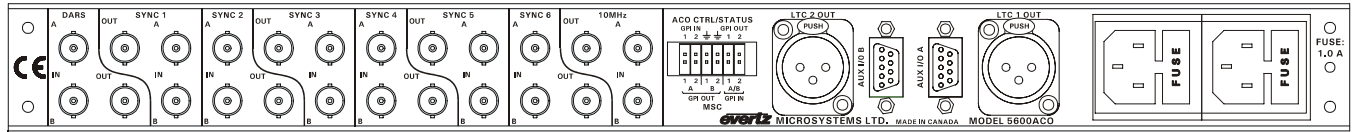
Figure 2-1: 5600ACO Rear Panel

The following sections describe the purpose of the rear panel connectors of the 5600ACO. Sections 2.1.1 to 2.1.3 describe the specific signals that should be connected to the 5600ACO. Sections 2.4 and 2.5 give more detail on connecting the system.

2.1.1. Coaxial Connections

There are 8 groups of 3 BNC connectors on the 5600ACO rear panel. In each group there is one labelled A, another labelled B for connection of the indicated signal from the respective 5600MSC Master Clock/SPG. The BNC labelled OUT provides the output from the auto changeover unit for further distribution throughout your plant.

DARS OUT   This group of BNC connectors is for connecting the Digital Audio Reference Signal (DARS) outputs.

SYNC 1 to 6: These groups of BNC connectors are for connecting the sync pulse / colour black outputs.

10 MHz: This group of BNC connectors is for connecting the 10 MHz outputs.

2.1.2. Linear Time Code, Parallel Remote Control and Auxiliary Connections

AUX I/O: These two 9 pin male 'D' connectors contain GPI inputs and outputs and two LTC outputs from the 5600MSC units and should be connected to the AUX I/O Connectors on the respective 5600MSC units using the straight through 9 pin cables provided. The pinout of the **AUX I/O** connector is as follows:

Pin #	Name	Description
1	LTC+	Primary LTC + output from 5600MSC.
2	GPO1	GPO 1 output from 5600MSC
3	AUX LTC+	LTC 2 out + from 5600MSC
4	GPI1	GPI 1 input from 5600MSC
5	GND	Signal Ground.
6	GPI2	GPI 2 input from 5600MSC
7	GPO2	GPO 2 output from 5600MSC
8	AUX LTC-	LTC 2 out - from 5600MSC
9	LTC-	Primary LTC – output from 5600MSC

Table 2-1: AUX I/O Pin Definitions

LTC OUT: These two male XLR connectors provide the balanced LTC1 and LTC2 time code outputs from the changeover.

ACO CTRL STATUS: The top row of the 12 pin terminal strip has two GPI inputs to control the 5600ACO and 2 GPI Outputs that provide tallies to indicate the status of the 5600ACO.

MSC: The bottom row of the 12 pin terminal strip has the two GPI Outputs from the A and B 5600MSC units and a pair of GPI inputs that will be connected to both the A and B 5600MSC units.

The cables can be secured into the removable portion of the terminal strips using a small screwdriver. The removable part of the terminal strip is then inserted into the rear panel and secured using the hold down screws. The pinout of this connector is shown in Table 2-2.

ACO GPI1	ACO GPI2	GND	GND	ACO GPO1	ACO GPO2
MSC A GPO1	MSC A GPO2	MSC B GPO1	MSC B GPO2	MSC A & B GPI1	MSC A & B GPI2

Table 2-2: ACO CTRL/STATUS and MSC GPIO Terminal Strip Pin Definitions

2.1.3. Power Connections

LINE: The 5600ACO has redundant universal power supplies operating on 100 to 240VAC, 60 or 50 Hz.

2.2. MOUNTING

The 5600ACO is equipped with rack mounting angles and fits into a standard 19 inch by 1 3/4 inch (483 mm x 45 mm) rack space. The mounting angles may be removed if rack mounting is not desired.

2.3. POWER REQUIREMENTS

Power requirements are 100 to 240 volts AC at 50 or 60 Hz. The 5600ACO has redundant universal power supplies that automatically sense the input voltage. Power should be applied by connecting a 3-wire grounding type power supply cord to each of the power entry modules on the rear panel. The power cord should be minimum 18 AWG wire size; type SVT marked VW-1, maximum 2.5 m in length.

The power entry modules combine a standard power inlet connector, two 5 x 20 mm fuse holders and an EMI line filter. See section 4.2.1 for information on changing the fuses

> **CAUTION - To reduce the risk of electric shock, grounding of the centre pin of the mains plug must be maintained**

> **Make sure that both power cords are disconnected before opening the top cover of the unit.**

2.4. 5600MSC CONNECTIONS

The 5600MSC unit connected to the A inputs of the 5600ACO will be called *Master A*. The 5600MSC unit connected to the B inputs of the 5600ACO will be called *Master B*.

2.4.1. Sync Outputs

Connect the six Sync outputs of the *Master A* 5600MSC unit to the A Sync inputs of the 5600ACO. Connect the six Sync outputs of the *Master B* 5600MSC unit to the B Sync inputs of the 5600ACO. Connect the Sync outputs of the 5600ACO to your plant distribution amplifier system.

> **To ensure proper signal detection and distribution, terminate each sync output with 75Ω. If a sync output is double terminated or unterminated, the 5600ACO will hunt for a good input signal by switching back and forth between input A and B. The flashing LEDs will indicate the Sync output at fault.**

2.4.2. 10 MHz Output

Connect the 10 MHz output of the *Master A* 5600MSC unit to the A 10 MHz input of the 5600ACO. Connect the 10 MHz output of the *Master B* 5600MSC unit to the B 10 MHz input of the 5600ACO. Connect the 10 MHz output of the 5600ACO to your plant 10 MHz reference system.

2.4.3. DARS Outputs

If your 5600MSC units are fitted with the AVTG option, connect the unbalanced DARS output of the *Master A* 5600MSC unit to the A DARS input of the 5600ACO. Connect the unbalanced DARS output of the *Master B* 5600MSC unit to the B DARS input of the 5600ACO. Connect the DARS output of the 5600ACO to your plant unbalanced AES distribution amplifier system.

2.4.4. LTC and GPIO Connections

Connect the AUX I/O output of the *Master A* 5600MSC unit to the A AUX I/O input of the 5600ACO using one of the straight through interconnect cables provided. Connect the AUX I/O output of the *Master B* 5600MSC unit to the B AUX I/O input of the 5600ACO using one of the straight through interconnect cables provided.

The LTC code outputs are available on two XLR connectors on the rear panel. Output level is from approximately 0.5 V to 4 V using the LTC LEVEL item on the *Output Setup* menu adjustable in the 5600MSC units. Pin 1 of the XLR is ground, and pins 2 and 3 provide a balanced output. The *LTC Output* sub-menus on the *Output Setup* menu in the 5600MSC units are used to configure the LTC outputs.

The GPI1 and GPI2 inputs on **both** 5600MSC units are connected to the GPI1 and GPI2 inputs on the bottom row of the 12 pin terminal block. The GPO 1 and GPO2 outputs on the *Master A* 5600MSC unit are available on the *MSC A GPO1* and *MSC A GPO2* pins on the bottom row of the 12 pin terminal block. The GPO 1 and GPO2 outputs on the *Master B* 5600MSC unit are available on the *MSC B GPO1* and *MSC B GPO2* pins on the bottom row of the 12 pin terminal block.

The ACO GPI1 and GPI2 control inputs for the 5600ACO are available on the *ACO GPI1* and *ACO GPI2* pins on the top row of the 12 pin terminal block. See section 3.4 for information about the operation of the 5600ACO GPI inputs. The GPO1 and GPO2 outputs from the 5600ACO are available on the *ACO GPO1* and *ACO GPO2* pins on the top row of the 12 pin terminal block. See section 3.5 for information about the operation of the 5600ACO GPO outputs.

The GPI and GPO cables can be secured into the removable portion of the terminal strips using a small screwdriver. The removable part of the terminal strip is then inserted into the rear panel. See Table 2-2 for the pinout of the terminal block.

2.4.5. Synchronizing the Menu Settings Of The Two 5600MSC Units

In the event of a changeover occurrence, it is necessary that all outputs on one 5600MSC have the same timing as those on the other. Identical timing for both 5600MSCs is assured by locking both to the same frequency and phase source (e.g. GPS or by genlocking one to the other). Identical phasing of the independent black outputs is assured by implementing the *Syncro* mode in the 5600MSCs. To use this mode, connect both 5600MSC communication ports together using the WA05600Synchro cable supplied with the 5600ACO or make your own as shown in Table 2-3. On the 5600MSC connected to the A inputs of the 5600ACO, set the *Serial Port Mode* to *Synchro Tx*. On the 5600MSC connected to the B inputs of the 5600ACO, set the *Serial Port Mode* to *Synchro Rx*. The system configuration of both units can now be accomplished by setting the menu items of the *Master A* unit only. Most of the menu settings on the *Master B* unit can be viewed but cannot be changed. These menu items will be dimmed when they are viewed on the *Master B* unit. Menu items of the *Master B* that can be changed will be shown in the normal display brightness. See the 5600MSC manual for a full description of *Syncro* mode operation.

5600MSC SynchroRx End			5600MSC SynchroTx End	
9 pin D Male	Pin	Belden 9501	9 pin D Male	Pin
	1			1
TxD	2	-------1b------	RxD	3
RxD	3	-------1a------	TxD	2
	4			4
Gnd	5	---drain----	Gnd	5
	6			6
RTS	7		CTS	8
CTS	8		RTS	7
	9			9
Frame Gnd	Shield	---drain----	Frame Gnd	Shield

Table 2-3: WA05600Synchro Cable

2.5.   CONNECTING THE GENERAL PURPOSE INPUTS AND OUTPUTS

The 12 pin terminal strip connector has 2 general purpose inputs and 2 general purpose outputs for control/status of the Auto changeover, as well as the GPI inputs and Outputs from the two 5600MSC units. The signals on the top row of the connector are for the 5600ACO only and do not connect to the 5600MSC units. (see section 3.3) The signals on the bottom row of the connector are connected directly to the 5600MSC units (see section 2.4.4). The GPI cables can be secured into the removable portion of the terminal strips using a small screwdriver. The removable part of the terminal strip is then inserted into the rear panel.

The GPI inputs are considered high if you leave an input floating (not connected) or pull it up to +5 volts. The GPI inputs are considered low when the GPI input is below 0.8 volts. The user can make the GPIs low simply by connecting the GPI input pins to ground using a button, switch, relay or an open collector transistor. Figure 2-2 shows the circuitry for each of the GPI input pins.
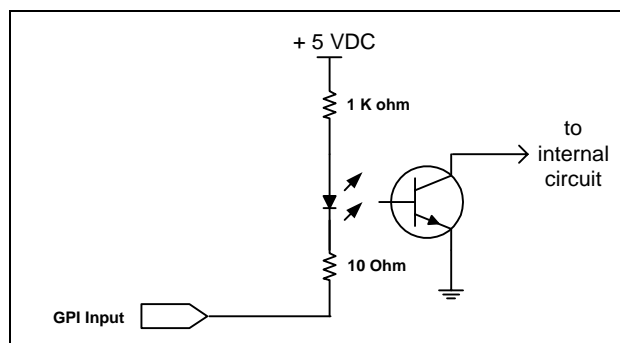
Figure 2-2: Typical GPI Circuitry.

The outputs are internally pulled up to 5 volts. Care must be taken to limit the load to 0.5W so there is no affect on the power supply source in the frame. Figure 2-3 shows the circuitry for each of the GPO output pins.
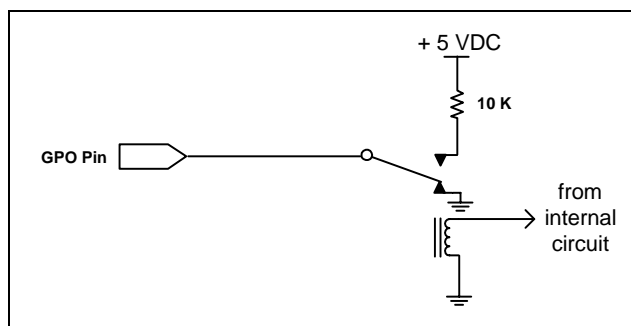
Figure 2-3: Typical GPO Circuitry.

2.6. CONNECTING 500ACO2-HD/SD AUTO CHANGEOVER MODULES

The Evertz 500ACO2-HD/SD dual SDI Auto changeover is designed to provide additional changeover switches to extend the capabilities of the 5600ACO for HD or SD serial digital video, DVB-ASI, AES audio or additional analog switches. These unit can also be operated as a standalone changeover unit with two independent 2X1.

The 5600ACO will act as the master and multiple 500ACO2-HD/SD can be used as slaved devices. In order to use the 500ACO2-HD/SD with the 5600ACO, the 5600ACO DIP switch must be set to enable ACO Extension mode. The DIP switch is located inside the 5600ACO, and is accessible by removing the top cover of the unit. (See section 3.3) To enable ACO extension mode set DIP switch 1 to the On (Closed) position. Multiple 500ACO2-HD/SD can be connected using the two available GPI outputs as shown in Figure 2-4.

> **The Front Panel GPI operating mode will be disabled when the 5600ACO is operating in ACO extension mode. (DIP switch 1 is set to the On position) The GPI LED will Blink when the *MANUAL CONTROL MODE* switch is set to the *GPI* position and DIP switch 1 is On. See section 3.4.**

When the 5600ACO is operating in ACO extension mode, and the front panel *CHANGEOVER MODE* switch is set in the *Auto* position, the 500ACO2-HD/SD modules will signal the 5600ACO the status of all the inputs by means of the *ACO GPI1* and *ACO GPI2* inputs. The 5600ACO will decide if a changeover is necessary based on all the inputs on the 5600ACO, and the *ACO GPI1* and *ACO GPI2* inputs from all the 500ACO2-HD/SD connected on the wired ORed bus. The 5600ACO provides control of the 500ACO2-HD/SD module's switches by means of the *ACO GPO1* output.

> **The 5600ACO firmware must be version 1.2 or higher to operate in this mode**
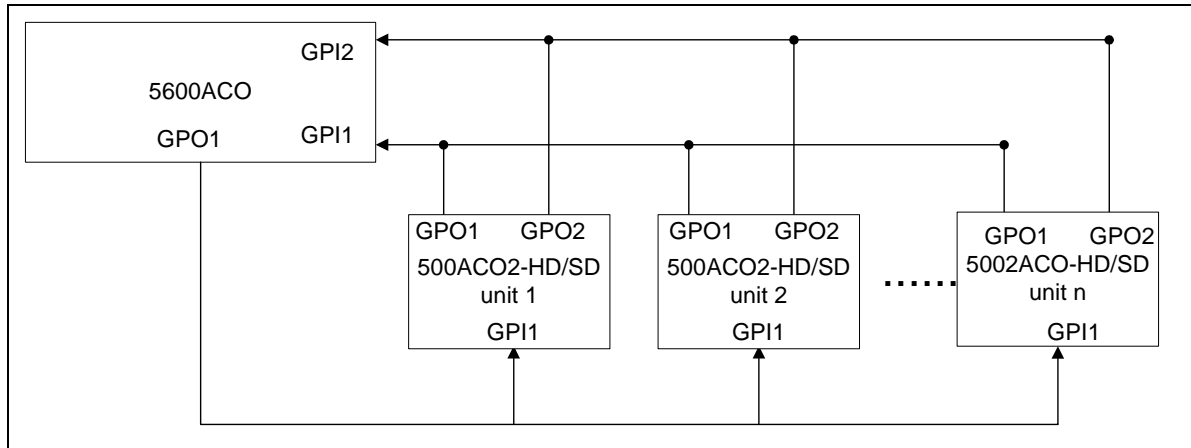
Figure 2-4: ACO Extension Mode Diagram

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3. HOW TO OPERATE THE AUTOMATIC CHANGEOVER
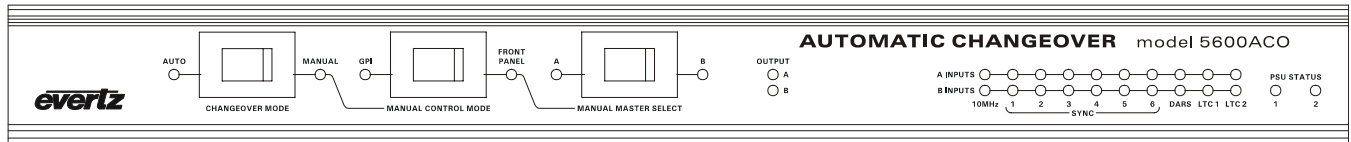
Figure 3-1: Model 5600ACO Front Panel Layout

The front panel controls consist of three recessed rocker switches to select the operating mode of the changeover and 30 LED status indicators.

3.1. AN OVERVIEW OF THE STATUS INDICATORS

There are 30 status indicators located on the front panel that show operational status of the 5600ACO at a glance.

3.1.1. Operating Mode Indicators

AUTO This green LED will be On when the unit is operating in the *Automatic* control mode.

MANUAL This green LED will be On when the unit is operating in one of the two manual control modes.

GPI This green LED will be On when the unit is operating in the *Manual GPI* control mode. The LED will be Off when the unit is in the *Manual Front Panel* or *Automatic* control mode. The LED will be flashing when *Manual GPI* control mode is selected but DIP switch 1 is not in the GPI Control mode position (set to Off). See section 3.2.2.

FRONT PANEL This green LED will be On when the unit is operating in the *Manual Front Panel* control mode. The LED will be Off when the unit is in the *Manual GPI* or *Automatic* control mode.

A This green LED will be On when the unit is operating in the *Manual Front Panel* control mode and that Master A is selected. The LED will be Off when Master B is selected or the unit is not in the *Manual Front Panel* control mode.

B This green LED will be On when the unit is operating in the *Manual Front Panel* control mode and that Master B is selected. The LED will be Off when Master A is selected or the unit is not in the *Manual Front Panel* control mode.

OUTPUT These two green LEDs indicate whether Master A or Master B is currently selected.

3.1.2. Input Indicators

A INPUTS   These ten green LEDs indicate that the respective input signals from the Master A device are present and valid.

B INPUTS   These ten green LEDs indicate that the respective input signals from the Master B device are present and valid.

The 5600ACO determines that an input is present and valid according to the following criteria:

Video:	Level below 70 IRE
Sync:	H timing detect
10MHz:	3dB level below 0.3Vp-p
DARS:	Sync word error
LTC:	Level below 0.3Vp-p
	Incorrect sync word

3.1.3. Power Supply Indicators

PSU STATUS 1, 2   These green LEDs indicate that the corresponding power supply is functioning normally.

3.2.   FRONT PANEL CONTROL

The Changeover can be operated in one of three modes as selected by the three rocker switches on the front panel.

The 5600ACO changeover uses latching relays that retain their state when there is no power applied. When there is no power applied to the 5600ACO, GPO2 will be connected to ground indicating a fault condition.

3.2.1. Automatic Changeover Mode

To operate the 5600ACO in *Automatic* mode, set the *CHANGEOVER MODE* switch to the *Auto* position. The 5600ACO will ignore the position of the other two switches in the *Automatic* mode. The *Auto* LED will come on. The *OUTPUT* LEDs will indicate the currently selected master. The 5600ACO will decide whether to select the A or B inputs based on which source has the most good signals and that the valid signals present on the currently selected master are also valid on the backup master.

When the 5600ACO is operating in ACO extension mode, (DIP switch 1 is On) and the front panel *CHANGEOVER MODE* switch is set in the *Auto* position, the 5600ACO will decide whether to select the A or B inputs based on all the inputs on the 5600ACO, and the *ACO GPI1* and *ACO GPI2* inputs from all the 500ACO2-HD/SD connected on the wired ORed bus.

With firmware version 1.4 and later there are two additional DIP switches that control the behaviour of automatic changeover mode. DIP switch 3 controls the amount of time that the 5600ACO takes to determine the validity of the input signals when a change occurs. DIP switch 4 controls whether the 5600ACO operates in primary (A Bank) reference mode or not. When primary reference mode is enabled, the 5600ACO will switch back to the A bank if all the A Bank signals become valid again. When primary reference mode is disabled, the 5600 will stay on the B Bank even when the A inputs all become valid again. The 5600ACO must be manually switched back to the A Bank by the user, using

the Front panel or GPI modes. Table 3-1 shows the behaviour of the 5600ACO when it is operating in Primary Reference mode.

A Inputs	B Inputs	Output
Good	Good	A Bank
Good	Bad	A Bank
Bad	Good	B Bank
Bad	Bad	No change

Table 3-1: Primary Input Preference Behaviour

3.2.2. Manual GPI Changeover Mode

To operate the 5600ACO in *Manual GPI* mode, set the *CHANGEOVER MODE* switch to the *Manual* position and the *MANUAL CONTROL MODE* switch to the *GPI* position. The *Manual* and *GPI* LEDs will come on. DIP switch 1 must also be set in the Off (open) position to enable GPI changeover mode. The 5600ACO will decide whether to select the A or B inputs based on the ACO GPI1 input on the top row of the terminal strip on the rear panel. When GPI1 is low Master A will be selected. When GPI1 is high Master B will be selected. The *OUTPUT* LEDs will indicate the currently selected master.

> ✎ **If DIP switch 1 is set to the On (Closed) position Manual GPI Changeover mode is disabled. The front panel GPI LED will Blink when the *MANUAL CONTROL MODE* switch is set to the *GPI* position and DIP switch 1 is On. See section 3.4.**

3.2.3. Manual Front Panel Changeover Mode

To operate the 5600ACO in *Manual Front Panel* mode, set the *CHANGEOVER MODE* switch to the *Manual* position and the *MANUAL CONTROL MODE* switch to the *Front Panel* position. The *Manual* and *FRONT PANEL* LEDs will come on. The 5600ACO will decide whether to select the A or B inputs based on the position of the *FRONT PANEL* switch. When the *FRONT PANEL* switch is set to *A* Master A will be selected and the *A* LED will come On. When the *FRONT PANEL* switch is set to *B* Master B will be selected and the *B* LED will come On. The *OUTPUT* LEDs will also indicate the currently selected master.

3.3. DIP SWITCHES

To gain access to the DIP switches you will have to remove the top cover.

> ⚠ **Before removing the top cover of the unit make sure that both the power cords are disconnected from the mains.**

There is an 8 position DIP switch located on the main circuit card inside the 5600ACO. The ON position is closest to the PCB. Table 3-2 shows the assigned DIP switch functions.

DIP Switch	Function
1	GPI Input Mode
2	
3	Fast Switch Enable
4	A Bank Priority Enable
5	Not used
6	
7	
8	

Table 3-2: DIP Switch Functions

3.3.1. Setting the Switchover Detection Speed

With firmware version 1.4 and later DIP switch 3 controls the amount of time the 5600ACO takes to decide that one or more of the inputs has failed. The slower switchover time provides protection for any transients that may occur in the system and is the default. The faster switchover time allows the 5600ACO to respond more quickly to failed signals.

DIP 3	Switchover Detection Speed
Off	Slow detection (250 ms)
On	Fast detection (1 ms)

Table 3-3: Switchover Detection Speed Switch Settings

3.3.2. Setting the Switching Priority Mode

With firmware version 1.4 and later DIP switch 4 controls whether the 5600ACO operates in Primary Reference Mode or not. See section 3.2.1 for a description of Primary Reference mode operation.

DIP 4	Primary Reference Mode
Off	Disabled – Bank A and B have equal priority
On	Disabled – Bank A has higher priority

Table 3-4: Primary Reference Mode Switch Settings

3.4. GPI INPUTS

There are three modes of operation for the GPI Inputs, controlled by DIP switches 1 and 2.

DIP 1	DIP 2	GPI Input Mode
Off	Off	GPI Control Mode – single GPI input
Off	On	GPI Control Mode – dual GPI input (default)
On	---	ACO Extension Mode

Table 3-5: GPI Input Mode Switch Settings

When DIP switch 1 is in the Off position, the ACO GPI inputs on the top row of the terminal strip on the rear panel are used in conjunction with the front panel switches to control whether the A or B inputs will be selected. Set the front panel *CHANGEOVER MODE* switch to the *Manual* position and the *MANUAL CONTROL MODE* switch to the *GPI* position. The 5600ACO will decide whether to select the A or B inputs in one of two modes selected by DIP switch 2.

GPI 1	GPI 2	Operation
Low	---	Master A inputs selected
High	---	Master B inputs selected

Table 3-6: Single GPI mode operation

In single GPI mode the 5600ACO is controlled by the ACO GPI1 input on the top row of the terminal strip on the rear panel. GPI2 is not used in this mode. When GPI1 is low Master A will be selected. When GPI1 is high Master B will be selected. The *OUTPUT* LEDs will indicate the currently selected master. Single GPI mode is the default condition in firmware versions prior to 1.3

GPI 1	GPI 2	Operation
Low	Low	Current bank selected (no change)
Low	High	Master A inputs selected
High	Low	Master B inputs selected
High	High	Current bank selected (no change)

Table 3-7: Dual GPI mode operation

In dual GPI mode the 5600ACO is controlled by both the ACO GPI1 and ACO GPI2 inputs on the top row of the terminal strip on the rear panel. When GPI1 is low and GPI2 is high, Master A will be selected. When GPI1 is high and GPI2 is low Master B will be selected. When both inputs are high or low, no action will be taken. The *OUTPUT* LEDs will indicate the currently selected master. Dual GPI mode is the default condition in firmware versions 1.3 and later.

> **The 5600ACO firmware must be version 1.3 or higher to operate in dual GPI mode**

When DIP switch 1 is in the On position, the GPI Inputs are used as tally inputs from 500ACO2-HD/SD changeover modules to extend the 5600ACO capabilities to switch HD and SD serial digital signals. See section 2.6 for information about connecting the 500ACO2-HD/SD modules.

> ✎ | **The 5600ACO firmware must be version 1.2 or higher to operate in ACO Extension mode**

3.5.   GPO TALLY OUTPUTS

There are two general purpose outputs that can be used to signal alarm conditions to the user. These outputs are driven by normally closed relays inside the 5600ACO. When the relay is energized (active), the output will be pulled to +5 volts by a 10 K ohm pull-up. When the relay is de-energized (normal) the relay contact will connect the output to ground. See Figure 2-3 for a schematic of the GPO output circuitry.

GPO1 is used to indicate whether Master A or Master B is currently selected. It will be low when Master A is selected and high when Master B is selected.

GPO2 is used to indicate whether the Master A and Master B inputs are identical and the power supplies are functioning correctly or not. It will be high when the inputs are identical and the power supplies are good, and will be low when the inputs are not identical, or one or both of the power supplies is not functioning correctly.

The default condition of the 5600ACO relays when there is no power applied is that the Master that was last active will be selected and GPO2 will be connected to ground.

4. TECHNICAL DESCRIPTION

4.1. SPECIFICATIONS

4.1.1. LTC Outputs

Standard: SMPTE 12M frame rate set by 5600MSC
Number of outputs: 2
Connectors: 3 pin male XLR type, Female DB9
Signal Level: Set in 5600MSC

4.1.2. Coaxial Inputs and Outputs

Type: Depends on signal connected from 5600MSC
DARS, bi-level or tri-level sync, colour black, 10 MHz
Number: 8 groups each consisting of two inputs and one output
Connector: BNC per IEC 169-8

4.1.3. ACO General Purpose Inputs and Output

Inputs:
  Front Panel Single GPI Control Mode (DIP switches 1 and 2 Off)
    GPI1: Master select in Manual GPI control mode
Low: Selects Master A
High: Selects Master B
    GPI2: Future use
  Front Panel Dual GPI Control Mode (DIP switches 1 Off and 2 On)
Master select in Manual GPI control mode
    GPI1: Low: Selects Master A
    GPI2: Low: Selects Master B
  ACO Extender Mode (DIP switch 1 On)
    GPI1, GPI2: Tally inputs from 500ACO2-HD/SD modules
Outputs:
    GPO1: Low: Master A is selected (default when the 5600ACO has no power)
High Master B is selected
    GPO2: Low: Master A & Master B differ or PSU failure
High: Master A and B have equivalent signals
Type:
  Inputs: Opto-isolated input with internal pull-up to + 5volts.
  Outputs: Normally closed relay to ground. 10K internal pull-up to + 5volts when relay is in active position.
Connector: 4 pins plus 2 ground pins on 12 pin removable terminal block
Signal Level: +5V nominal

4.1.4. MSC General Purpose Inputs and Output

Inputs: 2 GPI inputs connected to both Master A and Master B
Outputs: 2 GPI outputs connected from Master A through AUXI/O A
2 GPI outputs connected from Master B through AUXI/O B
Connector: 6 pins on 12 pin removable terminal block
Signal Level: As specified in 5600MSC manual

4.1.5. Changeover Conditions:

Changeover is a voting system based on which source has the most valid signals and that the good signals on the current master are also present on the backup master. The input signals are considered good according to the following criteria:

Video: Level below 70 IRE
Sync: H timing detect
10MHz: 3dB level below 0.3Vp-p
DARS: Sync word error
LTC: Level below 0.3Vp-p
Incorrect sync word

4.1.6. Electrical

Power: Autoranging 100 - 240 Volts AC, 50/60 Hz, 30 VA
Configuration: Dual redundant supplies
Fuse Rating: 250 V, 1 amp, time delay
Safety: ETL Listed, complies with EU safety directives
EMI/RFI: Complies with FCC Part 15 Class A regulations
Complies with EU EMC directive

4.1.7. Physical

Dimensions: 19" W x 1.75" H x 18.75" D.
(483mm W x 45mm H x 477mm D)
Weight: 8 lbs. (3.5kg)

4.2. SERVICING INSTRUCTIONS

CAUTION – These servicing instructions are for use by qualified service personnel only. To reduce risk of electric shock do not perform any servicing instructions in this section of the manual unless you are qualified to do so.

Make sure that both power cords are disconnected before opening the top cover of the unit.

4.2.1. Changing the Fuses

The fuse holder is located inside the power entry module. To change the fuses, disconnect the line cord from the power entry module and pull out the fuse holder from the power entry module using a small screwdriver. The fuse holder contains two fuses, one for the line and one for the neutral side of the mains connection. Pull out the blown fuse and place a fuse of the correct value in its place. Use time delay 5 x 20 mm fuses rated for 250 Volts with a current rating of 1 amp. Carefully reinsert the fuse holder into the power entry module.

Check that the line fuse is rated for the correct value marked on the rear panel. Never replace with a fuse of greater value.

4.2.2. UPGRADING THE FIRMWARE

4.2.2.1. Overview

The firmware in the 5600ACO is contained on a FLASH EPROM. From time to time firmware updates will be provided to add additional features to the unit.

You will need the following equipment in order to update the Firmware
- PC with available communications port. The communication speed is 57600 baud, therefore a 486 PC or better with a 16550 UART based communications port is recommended.
- Terminal program that is capable of Xmodem file transfer protocol. (such as HyperTerminal)
- New firmware supplied by Evertz (available at the download site on www.evertz.com)
- Special upgrade cable (Evertz part #WA S76). This cable is the same as the standard upgrade cable used with Evertz 7700 series or 500 series modules and can be found in the vinyl pouch at the front of the modular system binder. Alternately you can make your own cable with the pinout shown in Table 4-1.

Evertz End			PC End	
2 row X 3 pin Berg	**Pin**	**3 ft. Cable (9501)**	**9 pin D Female**	**Pin**
Key	1			1
Rx	2	-------1a------	Tx	2
Tx	3	-------1b------	Rx	3
Tx Gnd	4	----drain-----	Gnd	5
Key	5			
---	6			

Table 4-1: 7700 Series or 5600ACO Upgrade Cable (Evertz part #WA-S76)

To gain access to the upgrade serial port you will have to remove the top cover.

> **CAUTION – These servicing instructions are for use by qualified service personnel only. To reduce risk of electric shock do not perform any servicing instructions in this section of the manual unless you are qualified to do so.**

> **Before removing the top cover of the unit make sure that the power cord is disconnected from the mains.**

4.2.2.2. Terminal Program Setup.

1. Connect the Serial Upgrade cable to the 2 row x 3 pin header J34 on the main circuit board of the 5600ACO. The 2 x 3 pin header end should be keyed so that you do not insert it in the wrong direction.

2. Connect the 9 pin connector on the end of the serial update cable to the PCs' RS-232 communications port

3. Start the terminal program.

4. Configure the port settings of the terminal program as follows:

Baud	**57600**
Parity	**no**
Data bits	**8**
Stop bits	**2**
Flow Control	**None**

5. Power up the 5600ACO unit.

> **The Heat sinks on the power supply contain uninsulated "Dangerous voltage" that constitutes a risk of electric shock to persons. Exercise extreme caution so that hands and other body parts do not come in contact with these parts while the unit is powered up.**

4.2.2.3. Initiating Firmware Upgrade Mode From The Terminal Program

7. After the unit powers up, a banner with the boot code version information should appear in the terminal window. The cursor at the left side of the screen should be spinning.

   For example:

```
EVERTZ 5600ACO/87C52 MONITOR
COPYRIGHT 2003 EVERTZ MICROSYSTEMS LTD.
VERSION: 00000001  2003-01-21 11:45
VCTAG: dev
Flash ID: Mfr=0x89, Dev=0xC3

Press CTRL-X now to enter command mode.
 |
```

8. The following is a list of possible reasons for failed communications:

   - Defective Serial Upgrade cable.
   - Wrong communications port selected in the terminal program.
   - Improper port settings in the terminal program. (Refer to step 4 for settings). Note that HyperTerminal will not change port settings while connected. Click on HyperTerminal's "Disconnect" Button then click the "Reconnect" button to activate changes to the port settings.

9. While the cursor is spinning press the <CTRL> and <X> keys, this should stop the cursor from spinning. The spinning prompt will only remain for about 5 seconds. You must press <CTRL-X> during this 5 second delay. If the unit continues to boot-up, simply cycle the power and repeat this step.

10. Hit the <ENTER> key on your computer once.

11. Type the word "upgrade", without quotes, and hit the <ENTER> key once.

12. The boot code will ask for confirmation. Type "y", without quotes.

    For example:

```
Command prompt invoked.
BOOT> upgrade
ARE YOU SURE YOU WANT TO UPGRADE FLASH? [Y/N] y

UPLOAD FILE NOW, CTRL-X TO CANCEL
```

4.2.2.4. Uploading the new firmware

13. You should now see a prompt asking you to upload the file.

14. Upload the "*.bin" file supplied using the X-Modem transfer protocol of your terminal program. If you do not start the upload within 10 minutes the unit's Boot code will time out. You can restart the upgrade process by power cycling the unit.

    The 5600ACO application firmware the bin file will have a name something like

    1v41_1_5600ACO.bin

    The numbers at the beginning of the file name indicate the version of the firmware.

15. The boot code will indicate whether the operation was successful upon completion of the upload.

    For Example:

    ```
    UPLOAD OKAY
    ```

16. The following is a list of possible reasons for a failed upload:

- If you get the message "transfer cancelled by remote" you must restart the terminal program and load the bin file, then remove and install the module again.
- The supplied "*.bin" file is corrupt.
- Wrong file specified to be uploaded.
- Wrong file transfer protocol used – make sure you specify Xmodem, not Xmodem 1K.
- The PCs' RS-232 communications port can't handle a port speed of 57600.
- Noise induced into the Serial Upgrade cable.

4.2.2.5. Completing the Upgrade

17. Power cycle the unit. The unit should now reboot.

18. You can now close the terminal program and disconnect the RS-232 serial cable from the PC.

19. Replace the top cover of the unit.